**AMENDMENTS TO THE CLAIMS:**

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Currently amended) A method of limiting the movement of a robot, said method comprising the steps of:

constructing a physical safety barrier surrounding a movable robot including a base mounted on a floor;

defining in a memory a virtual safety barrier including a trajectory of a work or a tool mounted on a wrist of an arm of the robot in operation, the virtual safety barrier having boundaries spaced inward from the physical safety barrier and surrounding the work or tool;

defining in the memory a margin width of the virtual safety barrier, wherein a degree of freedom of a movement of the work or tool can be obtained;

defining in the memory at least two three-dimensional spatial regions including parts of the arm of the robot including said work or tool, wherein each of the three-dimensional spatial regions has a substantially spherical shape with a predetermined radius, wherein the radius for each of the three-dimensional spatial regions is configured to maintain a space efficiency;

calculating [[the]] a movement trajectory of the work or tool included in the defined three-dimensional spatial regions;

determining a predicted position of each of the defined three-dimensional spatial regions based on the trajectory calculation;

matching the predicted position of each of the defined three-dimensional spatial regions with said virtual safety barrier; ~~and~~

recognizing a forward position of at least one of the three-dimensional spatial regions spaced apart from the virtual safety barrier by a predetermined distance as a deceleration start position to safely stop the work or tool; and

carrying out a control to start the ~~braking~~ deceleration of the ~~arm at a~~ work or tool when at least one of the three-dimensional spatial regions is at the predetermined distance ahead of the virtual safety barrier and stop the movement of the [[arm]] work or tool ahead of the virtual safety barrier ~~if it is determined that any one of the three-dimensional spatial regions in at least one predicted position thereof based on the trajectory calculations will come into contact with a boundary of the virtual safety barrier~~.

2. (Previously presented) The method of limiting the movement of a robot according to claim 1, wherein said three-dimensional spatial regions are defined by at least one of the group consisting of a set of points, a set of lines, and an envelope sphere.

3. (Currently amended) A robot movement limiting apparatus comprising:

means for constructing a physical safety barrier surrounding a movable robot including a base mounted on a floor and defining in a memory a virtual safety barrier including a movement trajectory of a work or a tool mounted on a wrist of an arm of the robot in operation, the virtual safety barrier having boundaries spaced inward from the

physical safety barrier and surrounding the work or tool, wherein the virtual safety barrier has a margin width such that a degree of freedom of the movement of the work or tool can be obtained;

means for defining in the memory at least two three-dimensional spatial regions including a part of the robot including said work or tool, wherein each of the three-dimensional spatial regions has a substantially spherical shape with a predetermined radius, wherein the radius for each of the three-dimensional spatial regions is configured to maintain a space efficiency;

means for calculating [[the]] a movement trajectory of ~~included~~ the work or tool included in the defined three-dimensional spatial regions, and calculating a predicted position of each of said three-dimensional spatial regions based on the trajectory calculation;

means for matching the predicted position of each three-dimensional spatial region with said virtual safety barrier;

~~means for determining whether or not at least a part of the predicted position of any one of the defined three-dimensional spatial regions, based on trajectory calculations will come into contact with said virtual safety barrier;~~

means for recognizing a forward position of at least one of the three-dimensional spatial regions spaced apart from the virtual safety barrier by a predetermined distance as a deceleration start position to safely stop the work or tool; and

control means for starting the ~~braking~~ deceleration of the ~~arm at a~~ work or tool when at least one of the three-dimensional spatial regions is at the predetermined distance ahead of the virtual safety barrier and stopping the movement of the [[arm]]

work or tool ~~including the three-dimensional spatial region if it is determined that at least a part of the predicted position of the three-dimensional spatial region comes into contact with a boundary of the virtual safety barrier~~.

4. (Previously presented) The robot movement limiting apparatus according to claim 3, wherein said three-dimensional spatial regions are defined by at least one of the group consisting of a set of points, a set of lines, and an envelope sphere.

5. (Original) A robot having the robot movement limiting apparatus according to claim 3 or 4 as part of a control device.

6. (Original) A robot having a control device and two or more robots according to claim 5 that are controlled by said control device, wherein said means for defining in the memory said virtual safety barrier for each robot is capable of setting various margins for said virtual safety barrier.

7. (Canceled)

8. (Currently amended) A method of limiting the movement of a robot, said method comprising the steps of:

constructing a physical safety barrier surrounding a movable robot including a base mounted on a floor;

defining in a memory a virtual safety barrier including a trajectory of a work or a tool mounted on a wrist of an arm of the robot in operation, the virtual safety barrier having boundaries spaced inward from the physical safety barrier and surrounding the work or tool, wherein the virtual safety barrier is defined to be immovable with the robot under a working environment;

defining in the memory a margin width of the virtual safety barrier, wherein a degree of freedom of a movement of the work or tool can be obtained;

defining in the memory at least two three-dimensional spatial regions including parts of the arm of the robot including said work or tool, wherein each of the three-dimensional spatial regions has a substantially spherical shape with a predetermined radius, wherein the radius for each of the three-dimensional spatial regions is configured to maintain a space efficiency;

calculating the movement trajectory of the work or tool included in the defined three-dimensional spatial regions;

determining a predicted position of each of the defined three-dimensional spatial regions based on the trajectory calculation;

matching the predicted position of each of the defined three-dimensional spatial regions with said virtual safety barrier; ~~and~~

recognizing a forward position of at least one of the three-dimensional spatial regions spaced apart from the virtual safety barrier by a predetermined distance as a deceleration start position to safely stop the work or tool; and

carrying out a control to start the ~~braking~~ deceleration of the ~~arm at a~~ work or tool when at least one of the three-dimensional spatial regions is at the predetermined

distance ahead of the virtual safety barrier and stop the movement of the [[arm]] work or tool ahead of the virtual safety barrier ~~if it is determined that any one of the three-dimensional spatial regions in at least one predicted position thereof based on the trajectory calculations will come into contact with a boundary of the virtual safety barrier~~.

9. (Previously presented) The method of limiting the movement of a robot according to claim 8, wherein said three-dimensional spatial regions are defined by at least one of the group consisting of a set of points, a set of lines, and an envelope sphere.